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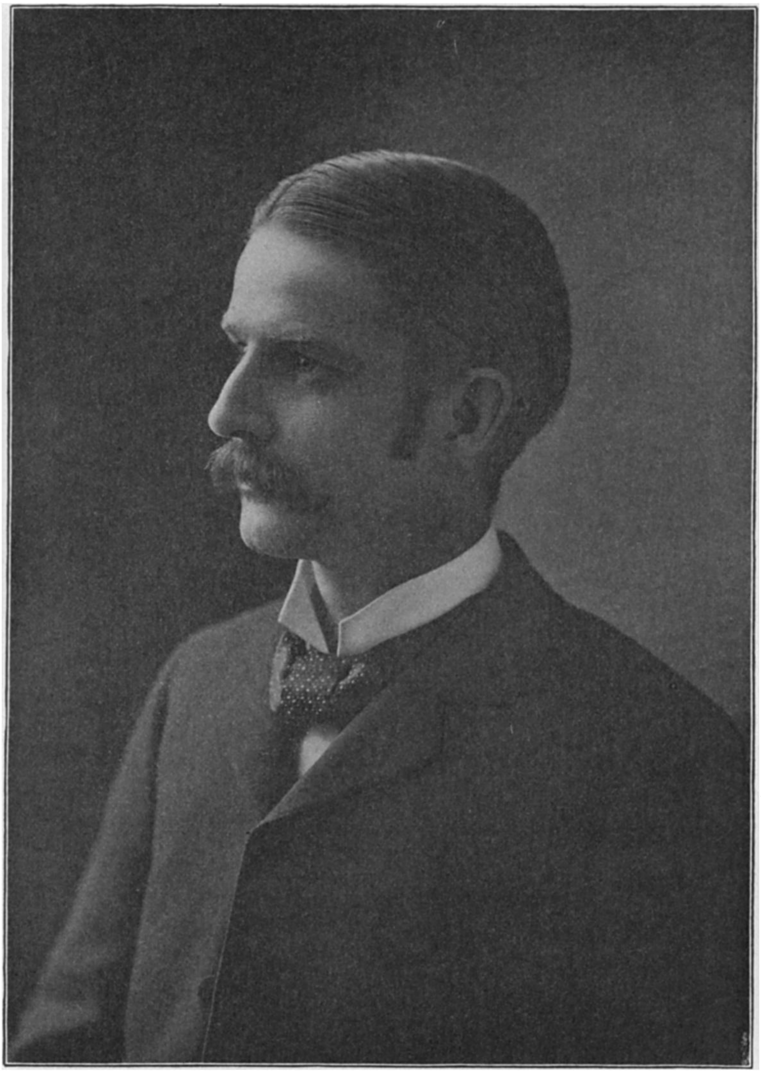

Charles E. Beecher.

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CHARLES EMERSON BEECHER.

ROBERT T. JACKSON.

In the death of Professor Beecher the science of Invertebrate Palæontology has lost a most brilliant and eminent leader. In his life so prematurely cut off, he attained a reputation for critical structural and developmental work on fossil animals and philosophical work on the same lines that placed him in the very front rank of his profession.

Charles Emerson Beecher, son of Moses and Emily Emerson Beecher, was born in Dunkirk, New York, October 9th, 1856. He died suddenly of heart disease on February 14th, 1904, in the forty-eighth year of his age. Always a delicate man he had recently been in exceptionally good health, so that his death came without warning. On September 12th, 1894, Professor Beecher married Miss Mary Salome Galligan, who with two young daughters survive him. He left also his mother and a brother, who reside in California.

In his early childhood the family removed to Warren, Pennsylvania, where he attended private and High schools. A born naturalist and collector he in childhood began collecting fossils from the Chemung and Waverly formations about Warren, amassing a choice and extensive collection in that region, especially valuable for the rare Phyllocarida and for Pelecypoda. He also collected living molluscs and minerals and became well versed in both lines of study. He took the science course at the University of Michigan, receiving the degree of B. S. in 1878.

In 1878 Beecher became assistant to Professor James Hall at Albany, where he remained for ten years. While at Albany he acquired an intimate knowledge of palæozoic fossils, so that with his truly remarkable memory, it seemed that he could name at sight any species offered to him. Always interested in microscopical work he prepared some two hundred and fifty sections of the shells of fossil brachiopods for study in connection with the work of the New York Survey on that group. Besides work on collections of fossils at Albany, he rendered important assistance to Professor James Hall in the preparation of that author's large quarto monographs on cephalous Mollusca,[1] Lamellibranchiata,[2] corals and Bryozoa.[3] As Beecher published little systematic work in later life I would lay stress on what he did as assistant to Professor Hall at this period. To quote Professor Hall, as stated in the Prefaces of the several works cited: "In the preparation and final revision of the descriptions of the species of Cephalopoda I have been very ably assisted by Mr. C. E. Beecher." Again, "In the final revision of the genera and species [of Lamellibranchiata] and in the preparation of the text and the later plates of this volume the author cheerfully acknowledges the very valuable assistance rendered by Mr. Charles E. Beecher." In the second volume on the Lamellibranchiata Professor Hall says: "In the revision of the species, and the publication of this volume, the author acknowledges with great satisfaction the assistance rendered by Mr. C. E. Beecher. In the last work cited on corals and Bryozoa Professor Hall says: "We are indebted to Mr. Charles E. Beecher for the preparation of the synopsis of the genera and sub-genera described and illustrated in this volume; and also for the explanation of plates, with reference to the pages of the volume and the localities of the species." Beecher also assisted Professor Hall in the publication of other works as seen by the texts during his Albany life.

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[1] *Natural History of New York.* Paleontology. Vol. 5, Part 2, Gasteropoda, Pteropoda, and Cephalopoda of the Upper Helderberg, Hamilton, Portage and Chemung Groups. Albany, 1879. p. 1–15 and 1–492, pl. 1–113.

[2] *Ibid.* Vol. 5, Part 1. Lamellibranchiata [of the Upper Helderberg, Hamilton, Portage and Chemung Groups.] 1, Albany. 1884. p. 1–18 and 1–268, pl. 1–33 and 81–92. 2, Albany, 1885. p. 1–62 and 269–562, 7 figs. pl. 34–80 and 93–96.

[3] *Ibid.* Vol. 6, Corals and Bryozoa .... from the Lower Helderberg, Upper Helderberg and Hamilton Groups. Albany, 1897. p. 1–26 and 1–298, pl. 1–66.

This extensive experience in pure systematic work laid the broadest foundation for Beecher's later developmental and philosophical studies, an experience that is markedly lacking or entirely left out in many who enter into biological problems. It is the expressed opinion of the present Palæontologist of New York State that the influence of Beecher on the palæontology of the State was for the best, and that during his stay of ten years he elevated the standard greatly.

In holidays at Albany he made extensive collections of Unionidæ and other living molluscs in that vicinity. This collection, with the large collections of Recent Mollusca that he gathered at Warren, Pennsylvania, also Michigan, and other localities, previous to going to Albany, he presented to the New York State Museum in 1886 and 1887. According to Mr. Wm. B. Marshall[1] this collection included some twenty thousand specimens and as many more which were considered duplicates, and is almost entirely made up of land and fresh-water shells of the United States, largely collected by Beecher himself. As shown by collating two of Marshall's published papers,[2],[3] there are in the Beecher collection at least one hundred and twenty-one species of land and fresh-water Mollusca, mostly from New York and Pennsylvania. One hundred and two localities are represented, seventy of which are in New York State, the others being in various parts of the United States.

Of the species some forty-three belonged to the Unionidæ, a beautiful series of which is on exhibition in the Albany Museum. The collection, which Marshall considered as exhaustive of the vicinity of Albany, is not only rich in species, but very full in series, representing specimens of the same species from various localities and of ages from young to adult. It is therefore very valuable for studies of later development, variation and geographical distribution. As a collection of fine selected material it stands an excellent proof of Beecher's indefatigable industry and appreciation of what a collection should be, much of it, it should be remembered, gathered when he was a youth, or even a child.

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[1] Marshall, Wm. B. List of Shells Inhabiting the Vicinity of Albany and Troy, N. Y. *48th Ann. Rept. N. Y. State Mus.*, Albany, 1895. Part 1, p. 641–647.

[2] Marshall, Wm. B. Land and Fresh-water Shells of New York exhibited at the World's Columbian Exposition, Chicago, Illinois, 1903. *47th Ann. Rept. N. Y. State Mus. Nat. Hist.*, Albany, 1894. p. 49–75.

[3] Marshall, Wm. B. The Geographical Distribution of New York Unionidæ. *48th Ann. Rept. N. Y. State Mus. Nat. Hist.*, Albany, 1895. Part 1, p. 45–99.

In the Albany Museum there are also many minerals and fossils collected by him, and numerous specimens of fossils prepared for exhibition. In free days at Albany he made frequent visits to the rich localities in the Helderberg mountains near Albany, especially Clarksville and Indian Ladder, collecting an extensive series of the fossils to be found there.

At this period Beecher published independently a paper on the Phyllocarida of Warren, Pennsylvania, a number of papers on the lingual dentition of Gastropoda, besides others on recent and fossil Pelecypoda, on geological localities, etc. His most important work was the publishing with Prof. John M. Clarke of a monograph on the development of Silurian Brachiopoda, based on material washed from the clays of Waldron, Indiana. This paper is of importance as the first work on the development of fossil Brachiopoda and opened up new lines of inquiry previously untouched. Always skilful with his pencil, at Albany he added to his income by making drawings for the medical men of that city. Nearly if not all his own papers were illustrated by his own drawings or photographs. During part of his stay at Albany Beecher was Assistant in Palæontology in the New York State Museum, when he did much to develop that department. After he left Albany he was retained for a period as Consulting Palæontologist to the museum, visiting Albany at intervals. Many details concerning his work and connection with the museum will be found in the 32nd to 43rd *Annual Reports of the State Museum.*

In 1888 Beecher went to New Haven as Assistant in Palæontology to take charge of the collections of invertebrate fossils in the Peabody Museum. He took the degree of Ph. D. at Yale in 1889, his thesis being a most interesting monograph on the Brachiospongidæ, of which rare fossil sponges the Yale Museum has a superb series.

Professor Marsh recognized Beecher's ability and his advancement was rapid. To state his official career at New Haven in brief: He was appointed Instructor in Palæontology in 1892, Assistant Professor of Palæontology in 1892, Professor of Historical Geology 1897, and member of the Governing Board of the Sheffield Scientific School in the same year. On the death of Professor Marsh he was in 1899 appointed Curator of the geological collections of the Peabody Museum. In 1902 his title was changed to that of University Professor of Palæontology.

In 1898 Beecher was elected corresponding member of the Boston Society of Natural History, in 1899 member of the National Academy of Sciences, and foreign correspondent of the Geological Society of London. In 1900 he was elected President of the Connecticut Academy of Arts and Sciences, filling that office for two years. While at New Haven he made many trips to western or nearer localities, collecting vertebrate and invertebrate fossils for the museum, and made a trip to Europe with the late Dr. George Baur, visiting museums.

Indian Ladder in the Helderberg Mountains was always a favorite and fertile spot for him, dating back to his Albany days. It is one of the most beautiful and picturesque regions in the Helderbergs. He collected there slabs of limestone containing fossils which were silicified in the most perfect condition for development by etching with acid. From such material he etched numerous large or minute specimens of surpassing beauty and scientific interest. Besides adult fronds of Bryozoa, Brachiopoda, Crustacea, and other fossils in most perfect preservation, he obtained minute embryos and small species in large numbers in literally wonderful condition of perfection. Young Bilobites $\frac{1}{2}$ mm. in length, young Acidaspis .93 mm. in length, and Arges 1.15 mm. long, both of the latter so perfect that he figured them from both the dorsal and ventral view; young Pleurodictyum, consisting of the initial cup alone, and also others with first lateral buds, young Bryozoa showing initial chambers. Such material selected with infinite care and patience formed the basis of a number of papers by Beecher and others. He etched also some very choice fossils from the Hamilton of Canandaigua Lake, New York. One sees and hears so much of poorly preserved fossils, that such exceptionally fine material is refreshing. He made a special point of seeking small and embryonic material by sifting clay from fossiliferous regions with a stream of running water. In this way he obtained choice material from Waldron, Indiana.

In June, 1899, Beecher gave his large and exceedingly valuable collections to the Peabody Museum as he said, "in grateful recognition of the honors and favors conferred upon me during my connection with the University."[1] These collections, made previous to his New Haven appointment, represent the result of twenty years' labor, they were collected wholly by himself and comprised upwards of one hundred thousand specimens, mostly from the Devonian and Lower Carboniferous of New York and Pennsylvania. They contained about five hundred type specimens, published in the *Palæontology of New York*, *Geological Survey of Pennsylvania*, and various scientific periodicals. They also contained hundreds of specimens representing series in development, rare species, and choice specimens exquisitely prepared to show structural detail.

His specimens were always fully labeled as regards locality and identification of genus and species, so that his collections of land and fresh-water molluscs previously mentioned and his collections of fossils represent an immense amount of labor and experience in the field and also in systematic zoölogy and palæozoölogy in working up the collections, and this all as a side-show to his regular work in official positions.

In his bachelor days at New Haven Beecher with Pirsson, Penfield and Wells roomed in "the attic," the top story of the Sheffield Scientific School, which was comfortably fitted up in true Bohemian style. One of the pleasantest recollections of visits to New Haven is visits to "the attic" where, after work hours, delightful intercourse, social and scientific was held, often far into the night.

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[1] *Science*, N. S. Vol. 10. p. 61. July 14, 1899.

Already interested in studies of the development of organisms from his work noted on the development of Silurian Brachiopoda, in 1889 Beecher became deeply interested in the late Professor Hyatt's methods of work. The application of the principles of stages in development, acceleration, parallelism, and dynamic genesis to the unraveling of the genealogical relations of living and fossil animals. Bringing to this work his large and intimate knowledge of species and the structure of fossil types, Beecher entered into this field with characteristic energy and became the leader of the Hyatt School. Beecher's reputation as an investigator will rest chiefly on the rich results he obtained in the critical, painstaking application of these fruitful principles that Professor Hyatt labored so long to establish.

Already interested in Brachiopoda, Beecher's first application of the Hyatt methods was to this group. Combining the study of young, adult, living and fossil types, he worked out a classification based on the principles of development, and divided the class into four orders. He pointed out the primitive Iphidea from the Lower Cambrian as the archaic radical from which the whole class could be derived. This stands to-day as perhaps the only example in which the primitive radical of a great group equal in systematic value to the Brachiopoda can be pointed out with reasonable assurance. Besides his work on the class as a whole, Beecher wrote many papers in which he worked out the development, structural and genealogical relations of families or minor groups of Brachiopoda. Such are his studies of the development of Bilobites, Terebratalia, Zygospira, and his remarkable studies of loop-bearing Brachiopoda. It is not too much to say that a careful study of Beecher's papers on brachiopods, and the same may be said of his trilobites, will give the student a more comprehensive view of the class than any other published source. Incidentally to his work on the group, Beecher accumulated a rich collection of recent species of Brachiopoda in the Yale museum, illustrating the structure and development, often by large series, in seventy-five species and five varieties, out of the total known number of one hundred and thirty-eight species and nine varieties of living brachiopods. This statement is taken from a list kindly sent me by Miss Lucy P. Bush, his assistant, who prepared it recently at Professor Beecher's request.

In corals he made important contributions by his beautiful studies of the development of Pleurodictyum and also the structure and development of the zoöids in the colonial form in Michelinia, Favosites and recently in Romingeria.

Thoroughly established in his adopted principles of research, in 1893 he began the publication of his brilliant papers on the structure, development and classification of the Trilobita. Favored by the discovery by W. S. Valiant of Triarthrus in unusual condition of preservation at Rome, New York, Beecher entered into the work. The presence of antennæ had been announced by W. D. Matthew; but Beecher with his marvelous mechanical skill and untiring patience worked out the structure of antennæ, legs and other ventral appendages with a minuteness that had previously been impossible on any known material. His studies of this type made our knowledge of the Trilobita as a class a new thing, putting them on a basis for proper comparative study with other Crustacea. He also took up studies of the development of Trilobita, describing the development in genera in which it was previously unknown or partially known. In 1897 Beecher presented a classification of Trilobita based on his critical studies of young and adult structures together with a consideration of the geological or time sequence, a natural basis for classification as urged by Louis Agassiz and Alpheus Hyatt and nowhere more beautifully carried out than in these trilobite studies. The Trilobita were divided into three orders based principally on the development of the free cheeks. At the time of his death he was at work on an extensive monograph on the structure of trilobites.

In all of Beecher's later work a strong philosophical bent was evinced. This was given full expression in his charming and forceful papers on the origin and significance of spines. In them he urged that spinosity is an expression of growth-force and differential development. The spinose individual or group of organisms begins as a smooth form, then becomes spinose in a progressively increasing degree until the acme or most elaborate spinosity is attained, then in extreme decadence there is a loss and final disappearance of spinosity, the individual and the group in senility tending to become smooth as in its own early growth. It is a graphic expression of the value of a new conception applied to well known facts.

The student of palæontology has reason to be grateful that many of Beecher's more important papers were combined and published in one volume, *Studies in Evolution*, in the Yale Bicentennial Series, 1901. It is a model of what minute, critical, philosophical palæozoölogical work should be. With characteristic modesty Beecher deplored as extravagance the republication of papers already in print. For the student it is a valuable aid that Beecher's views on Brachiopoda and Trilobita were incorporated in Eastman's translation of Zittel's *Grundzüge der Palæontologie*. The chapter on Brachiopoda being revised by Beecher's intimate friend, Mr. Charles Schuchert, and that on Trilobita being revised by Professor Beecher himself.

Beecher published many other papers besides those alluded to, on Gastropoda, Cephalopoda, and Crustacea, but although interested in stratigraphical and descriptive palæontology he published little in these lines. He published nothing outside of scientific papers as I am informed by Miss Lucy P. Bush. In a review of his papers I find 7 new orders, 1 new family, 2 new subfamilies, 7 new genera, and 20 new species. Most of his papers were brief, that on spinosity being the longest, many of them were combined however in his large work, Studies in Evolution. His bibliography includes some one hundred and eight titles. In addition he wrote a paper, "Extinction of Species," now in press in the *Encyclopædia Americana*, vol. 4. He was for several years an associate editor of this journal.

Being skilled with his hands, ingenious and fertile in mechanical resources, Beecher was an exceptional preparator, as evinced by his remarkable preparations of brachiopods and trilobites, and numerous specimens prepared for exhibition at the Yale University Museum. Especially noteworthy in this direction are the splendid slabs of Crawfordsville crinoids and Cretaceous

Uintacrinus, the huge mount of Brontosaurus and the gigantic yet life-like restoration of Claosaurus, besides numerous individual specimens of invertebrates in all groups. Beecher was a skilful photographer and Professor Hall published[1] his photomicrographs of brachiopod shell structure from slides also prepared by him. Later he published himself photomicrographs of the appendages of Triarthrus, exceptionally difficult subjects. He was a skilful microscopist and made numerous preparations of recent and fossil animals, especially noteworthy are his beautiful preparations of the radulæ of gastropods, sections of shells of brachiopods, sections of corals, sponges, etc. His microscope slides were always the perfection of neatness in finish. One method he adopted is very valuable for appearance and convenience. When sections had to be ground thin he did this on a ground glass slide, when the cover glass was in place the balsam filled the ground surface rendering it transparent, the ground glass forming an attractive border to the slide. This method obviates the necessity of transferring sections to a fresh slide, which is usually done at some risk, for the sake of appearances.

He took great interest in preparing models to illustrate structure, as shown in his models of the development and adult characters of loop-bearing types of brachiopods, his models of Triarthrus showing structure, from the dorsal and ventral view, and his restoration of the huge Devonian crustacean Stylonurus, measuring five feet in length. The details of museum technique also appealed to him strongly, so that he was a most able and successful museum administrator, constantly devising methods to improve the condition and accessibility of collections under his charge. The exhibition rooms of the Yale Museum are a graphic expression of his skill in selecting, preparing and exhibiting collections of fossils.

Beecher was fond of using mechanic's tools and as a relaxation did carpentering and cabinet work at the Museum or at his home. Full of resources he had many interests outside of his technical scientific work.

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[1] On the structure of the shell in the Genus Orthis, by James Hall. *36th Ann. Rep't. N. Y. State Mus. Nat. Hist.* 1884. p. 73–75, pl. 3–4.

Quiet, unassuming, modest in a very marked degree, simple, without affectation, entirely free from all eccentricities, conscientious and painstaking in every thing he had to do. In the words of Professor Chittenden, Director of the Sheffield Scientific School[1] ". . . . to those who knew Professor Beecher intimately no words of appreciation will be deemed too extravagant, for close association only brought more clearly to view the many mental traits that testified to the strength of character and of mind that helped to make Professor Beecher one of the strong men of the Scientific School."

Beecher was eminently successful as a teacher, as evinced by the devotion of his pupils and the able papers produced by students under his charge.

Always ready to help with advice, or specimens, he was an appreciative audience, a helpful critic, a warm friend with keen interest in his friends and their work. He will be deeply missed as a friend, and his untimely death deplored as a loss to the science in which he made such a brilliant mark.[2]

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[1] Professor Charles E. Beecher. His Life and Work Reviewed [by Miss Lucy P. Bush, not signed]. — Prof. Chittenden's appreciation — Mr. Schuchert's Sketch. [Tribute from a pupil.] *Yale Alumni Weekly*. New Haven, March 2, 1904. Vol. 13, no. 22, p. 487–489.

[2] The following obituary notices of Professor Beecher have also appeared.

Obituary notices were published in the following newspapers:

New Haven Morning Journal and Courier, Feb. 15, 1904. p. 6.

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Obituary — Charles Emerson Beecher. *Museum's Journal* [London], April, 1904. Vol. 3, p. 339–340.

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Professor Charles Emerson Beecher, Ph. D., [by H. Woodward, not signed]. *Geol. Mag.* [London], June, 1904. N. S. dec. 5, vol. 1, p. 284–286, portrait pl. 10.

Charles Emerson Beecher, by John M. Clarke. *Amer. Geol.*, July, 1904. Vol. 34, p. 1–13, portrait as pl 1.

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1884. **2.** Ceratiocaridæ from the Chemung and Waverly Groups of Pennsylvania. 2nd Geol. Surv. Penn. Rept. PPP. 1884. p. 1–22, fig. 1, pl. 1–2.

3. Some Abnormal and Pathologic Forms of Fresh-water Shells from the Vicinity of Albany, New York. 36th Ann. Rept. N. Y. State Mus. Nat. Hist. 1884. p. 51–55, pl. 1–2.

4. [The plates in James Hall's] On the Structure of the Shell in the Genus Orthis. 36th Ann. Rept. N. Y. State Mus. Nat. Hist. 1884. p. 73–75, pl. 3–4.

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[Reprinted in part in R. Ellsworth Call and Harry E. Pilsbry's] On Pyrgulopsis, a New Genus of Rissoid Mollusk, with Descriptions of two new forms. Proc. Davenport Acad. Nat. Sci. April, 1886. Vol. 5, p. 9–14, fig. 1–5.

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1886. **9.** Field Notes on the Geology of the Mohawk Valley, with a Map [by C. E. Beecher with C. E. Hall]. Fifth Ann. Rept. State Geologist [New York]. Albany, 1886. p. 8–10, 3 figs. [p. 4 for evidence of authorship].
[Reprinted, without map.] 48th Ann. Rept. N. Y. State Mus. Nat. Hist. Albany, 1895. Part 2, p. 54–56, 3 figs.

10. Note on the Oneonta Sandstone in the Vicinity of Oxford, Chenango County, N. Y. [by C. E. Beecher, with J. W. Hall and C. E.

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[1] An effort has been made to render this bibliography as complete as possible. Obligations are due to Miss Lucy P. Bush, Professor Beecher's assistant at New Haven, for a number of titles that would otherwise have been overlooked. All titles have been verified.

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